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ABSTRACT

This paper presents a decision-process model for explaining the growth in transfer recipiency (the receipt by working age people of disability income), the choice of work status, and the reduction in labor force participation of older workers. It is hypothesized that the attractiveness of disability income transfer options has led older male workers with health problems to choose transfer recipiency over work; this choice has led to the growth of disability transfer programs. In the framework presented, workers are in four categories: (1) seeking and obtaining employment; (2) seeking but not obtaining employment; (3) applying for disability and being found eligible; and (4) applying for disability and being found ineligible. The report concludes that worker response to increased transfer program leniency is a statistically significant though quantitatively small factor in the work status choice. (JCD)

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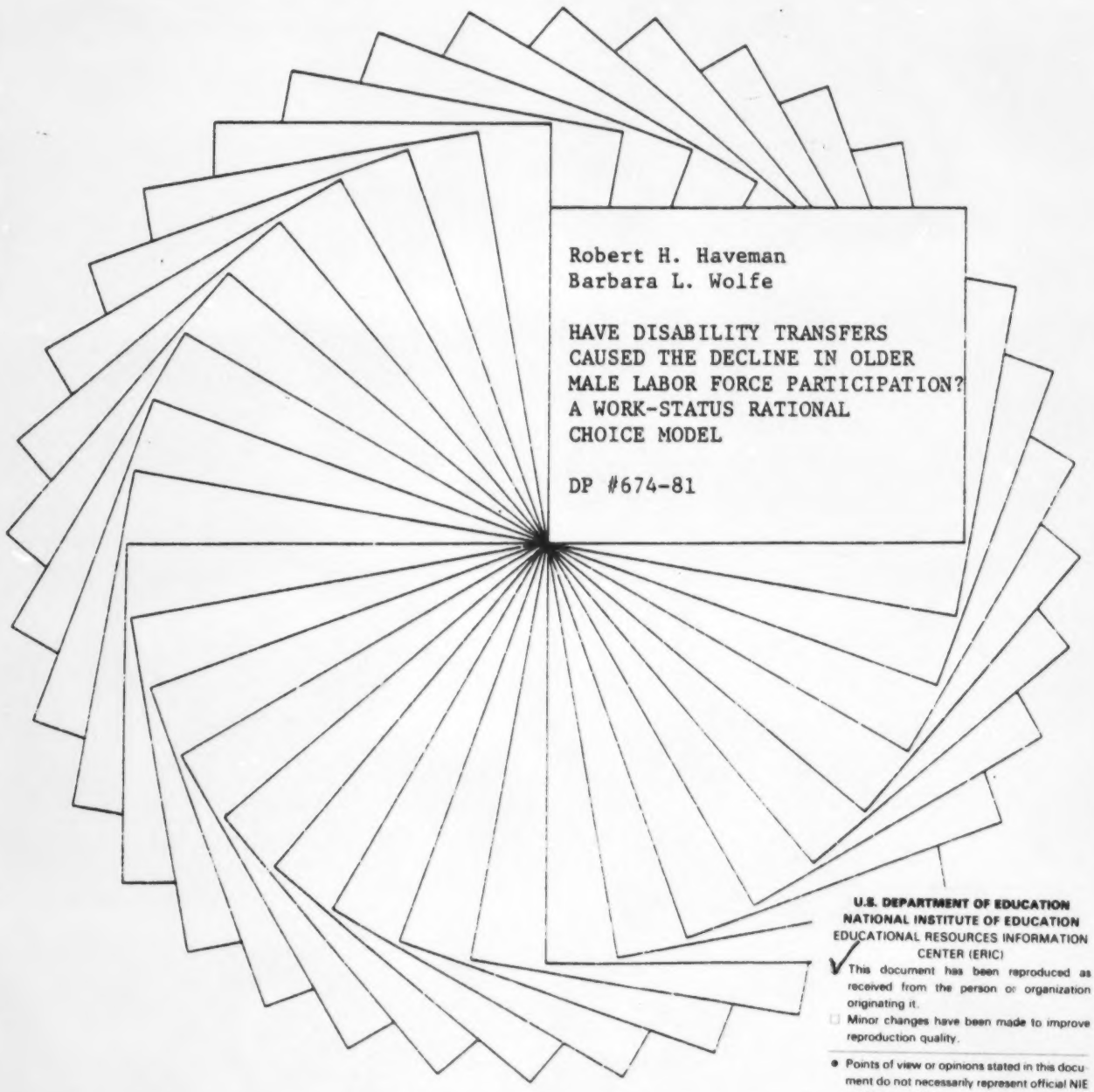

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DP #674-81

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Have Disability Transfers Caused the Decline in Older Male Labor Force Participation? A Work-Status Rational Choice Model

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ABSTRACT

The phenomenon of decreasing labor force participation of older male workers and increasing disability transfer rolls is explored in a reduced form probabilistic choice model. Workers are viewed as choosing among work statuses on the basis of the economic returns available in each status. The results of the model indicate that the generosity and leniency of disability transfer benefits is a statistically significant determinant of this discrete choice, but that the magnitude of this incentive is small. This result, which conflicts with those of prior studies, was tested with several variants of the probabilistic choice model and was found to be robust.

HAVE DISABILITY TRANSFERS CAUSED THE DECLINE IN OLDER MALE LABOR FORCE PARTICIPATION? A WORK-STATUS RATIONAL CHOICE MODEL

INTRODUCTION

Among the most notable social policy developments of the past decade in western industrialized countries is the growth in the number of recipients in and the public expenditures on disability programs for working-age people. Most of this growth has been concentrated in disability income support programs. There has been much speculation on the causes of this growth, including the liberalization of income support benefits, the extension of in-kind benefits, the inclusion of labor market conditions and vocational considerations in eligibility criteria, and the poor performance of the economies.

Table 1 presents estimates of the growth from 1968 to 1978 in the primary disability income support programs in seven western industrialized countries. The rates of increase in the number of disability income transfer recipients (column 2) are truly impressive for several of the countries. The Netherlands, for example, has experienced an average growth rate of over 11 percent per year. Even though the population growth rate in the Netherlands has been very low, the number of recipients increased from about 200,000 to nearly 600,000 over the decade. Italy and the United States have somewhat lower, though still substantial, rates of growth in the number of beneficiaries. The annual rates for these countries--7-8 percent--are very large, given annual population growth rates of 1-3 percent.

This growth in number of recipients is reflected in the growth rate of real expenditures on these programs, shown in column 3. Of the seven countries shown, the real growth rate has exceeded 10 percent in three.

Accompanying this growth in benefit rolls is the increased incidence of "early retirement"--the cessation or substantial reduction of work prior to the standard retirement age. In the United States, for example, 11.5 percent of males aged 45-59 were not labor force participants in 1980, as compared to only 4 percent in 1956. In other western countries, similar decreases in the labor force participation of older workers have occurred in recent years. These decreases are shown in column 1 of Table 1.

To some extent, the similar patterns shown in Table 1 are linked. The two countries with the smallest older worker labor supply reduction (France and the United Kingdom) also have the lowest indicators of disability program growth. Similarly, the Netherlands and Italy have among the largest labor supply reduction in the older worker group, and they rank in the top two in the indicators of program recipiency and expenditure growth. The United States and Sweden are intermediate in all of the indicators.

The similar patterns of growth in the percent of the older worker group not in the labor market and the percent receiving disability transfer benefits suggests that the increasing generosity of this and other disability income support programs is responsible at least in part for the reduction in work effort. However, while a high percentage of those who have left the labor force during past years do receive income support from disability transfer programs, that fact says little about the

determinants of these similar time-series patterns. Labor market opportunities have deteriorated over this period for older workers; the inci-

TABLE 1

Patterns of Decrease in Older Male Labor Force Participation Rates and Disability Program Growth, 1960s to 1970s, by Country

	Percentage Change in Ratio of Older to Prime-Age Worker Participation Rates, 1960s to 1970s[a]	Annual Rate of Growth of Disability Program Recipients, 1968 to 1978	Annual Rate of Growth of Real Disability Program Expenditures, 1968 to 1978
France	- 7.4%	- 1.3%	- 1.3%
Italy	-15.5	8.1	12.7
Netherlands	-14.8	11.3	18.6
Sweden	- 9.5	5.2	11.7
United Kingdom	- .2	2.0	.5
United States	-12.5	7.0	6.3
West Germany	-15.4	2.5	5.3

[a]In general, the age range for older male workers is 45 to 64. However, data for some of the countries includes older workers somewhat outside this age range. Prime age refers generally to ages 18 to 45.

dence of work-related impairments may have increased; more spouses are working and contributing to household income; eligibility standards may have been applied more leniently; tastes for work may have deteriorated; or the generosity of the benefits of transfer programs may have attracted an increasing number of potential beneficiaries out of the work force. All of these are relevant hypotheses for explaining the growth in disabi-

lity transfer recipiency and the reduction in labor force participation of older workers.

In this paper, we focus on one of these hypotheses--that the attractiveness of disability income transfer options relative to labor market options has led male workers with a health problem to choose transfer recipiency rather than work, and this choice has led to the growth of disability transfer programs. The framework is one of rational choice on the part of older workers in which economic position is maximized. We assume that each older worker compares two expected levels of economic well-being--one if he chooses to secure primary income support via working and labor market earnings, and the other if he chooses to rely primarily on disability income transfers, with little if any labor market activity. Essentially, then, the choice is between participating in the labor market and receiving the income flow associated with that option, versus seeking disability-related transfers and receiving the income flow associated with that option.

In section 2, we describe the specification of our model, which emphasizes the three primary determinants of the work effort choice of older workers: expected disability transfers, expected labor market income, and health status. In section 3, we describe the empirical approach to the model; in section 4, we discuss the data used, and the models estimated. The results are given in section 5. Finally, in section 6, we relate our results to those of others, draw the policy implications, and discuss additional research needs.

1. THE WORK EFFORT EFFECTS OF DISABILITY TRANSFERS: A REVIEW

The two most significant empirical studies of the work effort effects of disability transfers focus on older male workers.[1] These studies--by Parsons and by Leonard--are summarized in Table 2. Both are based on an

TABLE 2

Two Labor Supply Analyses of Disability Income Transfers

	Parsons (1980a, 1980b)	Leonard (1979)
Population Analyzed	Men, 48-62(a) or 45-59(b)	Men, 45-54
Data Used (all cross-sectional)	NLS, 1969(a) or 1966(b)	1972 SSSHWC, merged with benefit and earnings records
Dependent Variable	Participation in work force	DI recipiency
Program Variables	Potential DI and prior wage	Expected DI benefits
Specification	Probit	Logit
Results	Elast. of participation w.r.t. replacement rate = -1.8 (1966) or -0.63 (1969)	Elast. of recipiency w.r.t. expected benefits = 0.35

NLS = National Longitudinal Surveys of Labor Force Participation.

SSSHWC = Social Security Survey of Health and Work Characteristics.

explicit work-status choice model in which the individual rationally compares the expected income streams associated with being in alternative

labor force or disability transfer statuses and chooses that which maximizes his economic welfare. The expected income associated with being a labor force participant is proxied by the individual's expected earnings (wage rate), and that associated with reliance on disability transfers is measured by imputed values of disability benefits which would be received were this option chosen.

Parsons finds that the probability of labor force participation falls significantly as the "replacement rate" (the ratio of imputed disability transfer benefits to the earlier wage rate) rises. Both of the elasticities estimated in his analyses are very large, though quite different in magnitude. Parsons' study, however, uses a disability status measure (mortality experience after the observation period) which is a weak proxy for work limitations. Moreover, his estimates fail to recognize that receipt of program benefits depends on meeting the program eligibility criteria, positing instead that receipt is a matter of individual choice. Finally, his use of the replacement rate as the program variable confounds the roles of expected earnings and expected disability transfers, leaving the interpretation of his results unclear.

Like that of Parsons, Leonard's estimate of the elasticity of labor force participation with respect to expected Social Security Disability Insurance (SSDI) benefits is very large--about 40 percent of the decline in older labor force participation since the 1950s is attributed to increased benefit levels. However, the disability indicators used give no indication of the severity of the impairment or the degree of functional limitation, the proxy for expected labor income is weak, issues of selection bias surround important aspects of the estimation, and the identification of his system is problematic.

These studies support the view that the decision of older workers to withdraw from the labor force is strongly conditioned by the availability and generosity of disability transfers. However, as we have suggested, the empirical models contain numerous problems, and the estimated elasticities are so large as to cast doubt on their reliability.

2. THE PROCESS OF WORK STATUS DETERMINATION

In a context in which numerous options exist for securing income, the process by which the work status of any individual is determined is complex. It involves not only the preferences and choices of the individual, but also the decision rules of those who determine eligibility for or entry into the options. Consider a two-option case in which an individual can secure income by either gaining eligibility for disability transfer benefits or obtaining employment. In this case, there are three potential decisionmakers whose choices will affect the final determination of the status of any given individual: the individual who has certain characteristics, preferences, and objectives; employers who choose workers to meet their objectives; and administrators of disability programs who apply program eligibility rules. The ultimate work status outcome will reflect the decisions of all of these individuals, each with differing objectives.

Other factors will also contribute to the determination of this final work status outcome. For example, not all individuals will apply for entry to each of the options, even though the probability of their being eligible is greater than zero. In a situation in which applying for entry into a status is costly, applications will only be made if the gain in expected income (the expected income if eligible for the option less

the expected income in the alternative status) exceeds the cost of applying.[2] In addition to the opportunity costs associated with applying to entry to either option, application may be restricted because of lack of information, inertia, or stigma.[3]

Consider the simple schema of Figure 1 which depicts this process in the case of an individual confronted with two potential options--a labor market-work option and a disability transfer recipiency option.

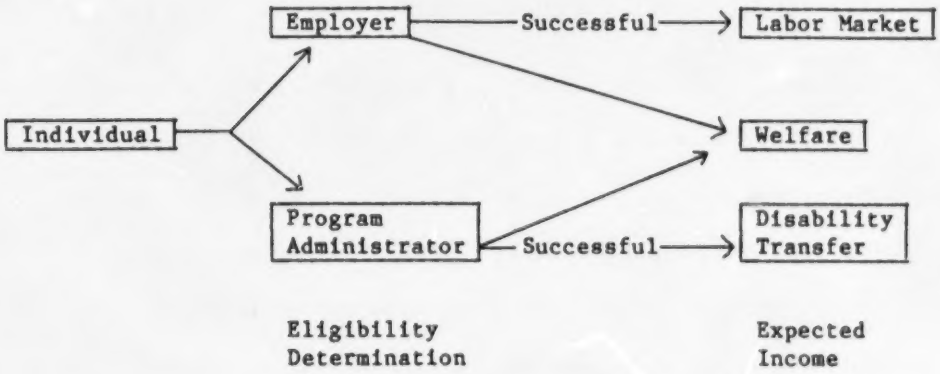

Figure 1

Assume first that the individual has full information regarding his eligibility status in each option--or, equivalently, that the cost of application to each option is costless. Assume also that the individual is a utility maximizer, and that utility is a function only of money income. In this case, the individual's choice is straightforward--he compares the expected income stream in the available options and chooses that option with the highest expected income.

Let us now complicate this framework somewhat. Assume that the individual does not have full information regarding eligibility status in

each option, and that the costs of applying for access to each option are positive and non-trivial. Having once chosen to secure access to one of the options, the individual's status over the period of analysis is fixed in that option. Only in subsequent periods can a choice be made to pursue the alternative option. The ex post or actual income level in the option chosen may fall short of or exceed the individual's ex ante estimate of expected income. In particular, if application to an option is made but the individual is found ineligible, actual income will be less than expected income.

In this framework, four possible short-run outcomes are possible. They are: 1) seeking employment and obtaining it, 2) seeking employment and not obtaining it, 3) applying for disability transfers and being found eligible, and 4) applying for disability transfers and being found ineligible. In options 2) and 4), short-run recourse to the alternative option is not possible and income at some level less than the expected value is received. This income level can be viewed as "welfare" and set at the same value in both states 2) and 4). In the longer run, recourse to the alternative option may be pursued.

A more formal specification of this process from the perspective of the individual is as follows. Individual choice as to which option to pursue in the current period is based on the objective of maximizing economic returns, defined as the expected value of the income flow in the period associated with each of the options. This expected value is the probability of being admitted to the option (say, disability transfer recipiency) times the income flow received if admission is granted.[4] For the labor market (LE) and disability transfer (DT) recipiency options, respectively,

$$E(LE) = P(LE > 0) \cdot LE \quad (1)$$

$$E(DT) = P(DT > 0) \cdot DT \quad (2)$$

Comparing these two expected values, the individual will choose that option yielding the greater income flow, i.e., if $E(LE) > E(DT)$ the individual will choose the labor market option.

If ascertaining eligibility for disability benefits or employment is costly, the individual frames his estimates of the probability of admittance into each option on the basis of his observation regarding the experience of those individuals with characteristics like his who have sought entrance into the options. For the labor market option,

$$P(LE > 0) = \alpha_1 D^* + \beta_1 X_1 \quad (3)$$

where D^* is the individual's true disability status, X_1 is a vector of background characteristics related to being accepted into the labor market option if one applies, and α_1 and β_1 are the weights placed on each of the determining factors. From (3), the individual can estimate the probability of securing labor market earnings if he seeks them, $\widehat{P(LE > 0)}$. Similarly, the probability of securing disability transfers if the individual applies, $\widehat{P(DT > 0)}$ depends on the individual's observations of the experiences of others like him, and can be calculated from (4):

$$P(DT > 0) = \alpha_2 D^* + \beta_2 X_2, \quad (4)$$

where X_2 is a vector of background characteristics related to eligibility for disability transfers and α_2 and β_2 are the weights placed on each of the determining factors.

Conditional on being accepted into an option, the expected value of the income flow in that option is obtained by observing those who have chosen to apply for and who are receiving income from the option. For the labor market and disability transfer recipiency options, respectively:

$$LE/(LE > 0) = \alpha_3 D^* + \beta_3 X_3 \tag{5}$$

$$DT/(DT > 0) = \alpha_4 D^* + \beta_4 X_4 \tag{6}$$

LE and DT are the income flows from the labor market and disability transfer options, X_3 and X_4 are vectors of background characteristics related to income determination in each option, and the α_i's and β_i's are the weights placed on the determining factors.

For any individual, then, the probability of choosing, say, the labor market option, P(LM), is

$$P(LM) = \rho\widehat{E(LE)} + \eta\widehat{E(DT)} \tag{7}$$

in which $\widehat{E(LE)} = \widehat{P(LE > 0)} \cdot \widehat{(LE/(LE > 0)}$, $\widehat{E(DT)} = \widehat{P(DT > 0)} \cdot \widehat{DT/(DT > 0)}$, and ρ and η capture the responsiveness to increases in either expected income flow.

3. EMPIRICALLY MODELING THE WORK STATUS CHOICE

General Approach

Developing a reliable empirical test of this work status choice framework is not straightforward. Knowledge of the success of individuals with various characteristics in obtaining admission to the options to which they apply is required in order to depict the process by which

admission to each option is determined. Moreover, the income flows received by individuals of various characteristics who choose to apply to each option and who are admitted to the option must be known.

If this information were known the following decision process could be empirically modeled. Individual A seeks to maximize his economic status, taken to be his expected income over the next short-run period (say, one year). Stigma costs associated with either option, the value of leisure time, and work-related expenses are assumed to be zero. The cost of applying to either option is the income foregone by not applying to the other; longer-run implications of the choice are ignored. At the beginning of the year, the individual must decide which of the two options to pursue. This decision is fixed in the short run, though decisions in subsequent years may reflect the outcome in this period. The information which the individual has available on which to base his choice consists of knowledge regarding 1) the options to which individuals with various characteristics have applied for admission, 2) the success or failure of their application, and 3) the incomes of these individuals if they are successful in one of the options.

Given this information, the individual can estimate the probability of receiving labor market income [P(LE > 0)] or disability transfer income [P(DT > 0)] given that application has been made:

$$P(LE > 0) = a_1 y_1 + e_1 \tag{8}$$

$$P(DT > 0) = a_2 y_2 + e_2. \tag{9}$$

(8) and (9) are fit over applicants for labor income and disability transfers, respectively, where y_1 are vectors of the independent

variables influencing the eligibility decisions, including true disability status (D*), a_i are the coefficients to be estimated, and e_i are the error terms.

The individual can also estimate the income flow expected in the labor market (LE/(LE > 0) and disability transfer recipiency (DT/(DT > 0), given that admission to each option has been granted:

$$LE/(LE > 0) = a_3y_3 + \delta_1\lambda_1 + e_3 \tag{10}$$

$$DT/(DT > 0) = a_4y_4 + \delta_2\lambda_2 + e_4. \tag{11}$$

(10) and (11) are fit over those with observed labor earnings and observed disability transfers, where y_i are vectors of the independent variables influencing the income flows, including the disability status (D*), a_i are the coefficients to be estimated, λ_i are selectivity correction terms from (8) and (9), δ_i are coefficients on the selectivity terms to be estimated, and e_i are the error terms. From (8) - (11), the individual obtains: 1) the probability of being eligible for each of the work status options if he applies, based on the observed outcome of applicants with his characteristics and 2) the income which he can expect to receive in each of the options if his application is successful, again based on the observed outcomes of successful applications with his options.

For any individual, then, the probability of choosing the labor market option, P(LM):

$$P(LM) = \rho_1[\widehat{P(LE > 0)} \cdot \widehat{LE/(LE > 0)}] + \eta_1 [\widehat{P(DT > 0)} \cdot \widehat{DT/(DT > 0)}] + e_5, \tag{12}$$

where ρ_1 and η_1 are coefficients measuring the responsiveness of the choice to these expected values, and e_5 is the error term. The individual will choose that option for which the expected income--defined as the product of the probability of being eligible if application is made and the income flow anticipated if eligible--is the greater.[5] If the worker chooses to work he chooses labor earnings as his primary source of income. In the second option, disability transfer recipiency is chosen at the cost of foregone market opportunities.[6]

Specific Approach

If the outcome of applications of individuals with various characteristics who seek entry to the labor market and disability transfer options was known, $\widehat{P(LE > 0)}$ and $\widehat{P(DT > 0)}$ could be estimated for each individual from (8) and (9). In our data base, however, neither information on which individuals apply for each option nor information on the outcome of applications to each option is known. What is observed is the presence of individuals in either the labor market or disability transfer options. While this information deviates from that required for estimating (8) and (9) it does enable the estimation of the probability that an individual with various characteristics will be in the labor market and disability transfer options, $P(ALE > 0)$ and $P(ADT > 0)$, respectively.

$$P(ALE > 0) = a_1' y_1 + e_1' \tag{8a}$$

$$P(ADT > 0) = a_2' y_2 + e_2' \tag{9a}$$

(8a) and (9a) are fit over all observations, in which y_1 are vectors of background characteristics related to being in each status, including the

disability status D*, a_i's are coefficients to be estimated, and e_i's are the error terms.

While $\widehat{P(ALE > 0)}$ and $\widehat{P(ADT > 0)}$ are less than ideal proxies for $\widehat{P(LE > 0)}$ and $\widehat{P(DT > 0)}$, they do reflect the eligibility determination process for both the labor market and disability transfer options. However, other factors are also reflected. Consider, for example, an individual with a particular set of characteristics for whom $\widehat{P(ALE > 0)}$ = .8, implying that 80 percent of all individuals with these characteristics will be observed in the labor market option. This value, .8, will be a minimum bound to the estimate of $\widehat{P(LE > 0)}$, the percentage of individuals with that set of characteristics who, having applied for employment, are accepted for work. Because of taste differences or differences in the costs of applying, some individuals with these characteristics will not have applied for the labor market option and others, concluding that the actual income flow is less than the expected, will have pursued the alternative option. Hence, the difference between $\widehat{P(LE > 0)}$, and $\widehat{P(ALE > 0)}$ will reflect varying applicancy costs, varying work-transfer recipiency tastes, or varying responses to actual outcomes in earlier periods. These differences are unobserved.[7]

If $\widehat{P(ALE > 0)}/P(LE > 0) = k$ and $\widehat{P(ADT > 0)}/P(DT > 0) = k$ over all groups of individuals, using (8a) and (9a) would create little bias. However, the ratio of the probabilities would appear to be a positive function of the desired probabilities, $\widehat{P(LE > 0)}$ and $\widehat{P(DT > 0)}$. Since the probability of being in the labor market is quite high, information on that option is more readily available than the alternative. Moreover, the costs of applying are relatively low. Hence, the ratio of $P(ALE > 0)/P(LE > 0)$ is likely to be closer to 1 than $\widehat{P(ADT > 0)}/P(DT > 0)$ is to 1.

We follow a two-step procedure in obtaining an estimate of expected income in each option. The probability of being in the labor market group [P(ALE > 0)] is estimated as a function of the individual's health status and background characteristics,

$$P(ALE > 0) = \alpha_1' D^* = \beta_1' X_1 + \varepsilon_1 \tag{13}$$

where X_1 is a vector of background characteristics related to being in the labor market group, ε_1 is the error term, and α_1' and β_1' are coefficients to be estimated. From (13), fit over all observations, we predict the probability of being in the labor market group, $\widehat{P(ALE > 0)}$.

The absence of some observations from the labor market group suggests that estimating the income flow for each observation in the sample if the labor market option is chosen (LE) based on a regression fit over those in the group will be subject to selection bias.[8] Hence, to estimate the income flow if the labor market option is chosen and entry to that option is successful, we fit (14) with the standard Heckman (1976) procedure:

$$LE/P(ALE > 0) = \alpha_2' D^* + \beta_2' X_2 + \delta_1 \gamma_1 + \varepsilon_2 \tag{14}$$

in which λ is the inverse of the Mill's ratio[9] obtained from (13), α_2' and β_2' are coefficients to be estimated, δ_1 serves as the coefficient on λ, and ε_2 is the relevant error term.[10]

The product of expected income[11] if in the labor market group [$\widehat{LE/P(ALE > 0)}$ from (14) and the probability of being in that group $\widehat{P(ALE > 0)}$ from (13)], yields the estimate of expected income if the labor market option is chosen,

$$E(LE) = \widehat{P(LE > 0)} \cdot \widehat{LE/P(LE > 0)} \tag{15}$$

This expectation forms one element in the individual's decision regarding work status.[12]

In this formulation, then, we presume that the individual, with his characteristics, is best viewed as seeking entry to the labor market group, with some probability of success in earning income in this status. If he is successful, the level of income received depends upon his characteristics, including health status. Hence, knowing the individual's health and other characteristics, and the nature of the labor market, his expected income if he were to choose the labor market option is the product of the estimated probability that he will be successful in becoming a member of the labor market group if he applies [proxied by $\widehat{P(ALE > 0)}$] and the expected level of income if in that group.

The second element in the individual's choice of work status is the monetary reward that can be secured by pursuing the disability transfer recipiency option. Because this option involves little if any work effort, the value of this reward can be thought of as a shadow price of the person's time. For older males, the primary determinant of this reward is the availability of disability-related transfers. Again, the individual is best thought of as seeking disability-related transfers and, because of earnings limits in the programs, as foregoing income associated with the labor market. Each individual faces some probability of success in securing eligibility for such transfers. This probability, $P(DT > 0)$, depends on the individual's health status, his other characteristics, and the eligibility determination process for the disability transfer recipiency option. Because of the same data constraints mentioned above, $P(DT > 0)$ is proxied by $P(ADT > 0)$. Each individual has some expected value of the income flow available in the disability

transfer option if he is found eligible for it, DT/P(ADT > 0), which value depends on his disability status, the benefit levels implicit in disability transfer programs, and, to a lesser extent, human capital, other socioeconomic characteristics, tastes for leisure, labor market conditions, and other transfer program characteristics. If we know the relevant characteristics of the individual (including health status), the characteristics of the transfer program and of the labor market, then expected income from the disability transfer recipiency option equals $P(ADT > 0) \cdot DT/P(ADT > 0)$[13]:

$$P(ADT > 0) = \alpha_3' D^* + \beta_3' X_3 + \varepsilon_3 \tag{16}$$

$$DT/P(ADT > 0) = \alpha_4' D^* + \beta_4' X_4 + \delta_2 \lambda_2 + \varepsilon_4 \tag{17}$$

$$E(DT) = \widehat{P(ADT > 0)} \cdot \widehat{DT/P(ADT > 0)} \tag{18}$$

where X_3 is a vector of background characteristics (some specific to the individual and others to the eligibility determination process for disability transfers) related to being in the disability transfer recipiency group, X_4 is a vector of background characteristics explaining income flow in the disability transfer recipiency option, λ_2 is the selectivity correction term from (16),[14] α_1''s, β_1''s and δ_2 are the coefficients to be estimated, and ε_3 and ε_4 are the relevant error terms.

When expected income from the labor market option is less than the shadow price at zero labor supply, i.e., E(LE) < E(DT), the individual will not choose the labor market option; if E(LE) > E(DT), the individual will choose that option. Hence, the probability of choosing the labor market option, P(LM), is

$$P(LM) = \rho_1' \widehat{E(LE)} + \eta_1' \widehat{E(DT)} + \varepsilon_5, \tag{19}$$

where ρ_1' and η_1' are coefficients measuring the responsiveness of the choice to these expected values and ϵ_5 is the error term.

A number of simplifying assumptions underlie this procedure. We have already dealt with P(ADT > 0) as a proxy for P(DT > 0) and P(ALE > 0) for P(LE > 0). In addition, because it is expected monetary values (as tempered by the stigma costs of not working) which are taken to determine the choice among work status options, we are ignoring both work-related costs and the benefits in the forms of leisure from not working. Also, we fail to fully characterize the set of income expectations in the two work statuses. For example, we neglect some sources of income--in particular, fringe benefits--the availability of which may depend on work effort status. We do not take into account the value of medical insurance--either private or Medicare and Medicaid--which may be associated with each income stream. For those choosing the disability transfer recipiency option, these may have high expected values. However, the value of these benefits in occupations offering health insurance as a fringe benefit may be similar to the value of Medicare coverage associated with disability transfer recipiency.

4. DATA AND MODEL SPECIFICATION

The empirical analysis uses data from the Panel Study of Income Dynamics (PSID). While the choice of work status in the latest year--1978--is the focus of the study, the panel character of the data allows construction of variables related to past earnings, occupational change, and the duration of impaired status. (The specific variables employed are described in Appendix 1.)

One of the primary concerns in this study is the role of health status in the work choice of older workers. For 8 of the 11 years of survey data, respondents were asked whether or not they were disabled. In most cases the extent of disability is also asked. From this information, we created disability measures which capture both the duration and the intensity of the impairment. These are appropriate measures for modeling the receipt of transfer benefits, such as those provided through SSDI, which is designed to provide support for those unable to participate in "substantial gainful activity." The duration and intensity of health problems are also likely to influence earnings. Employees may be less willing to continue to hire individuals with intermittent, persistent, or long-term health problems. Similarly, the disabled person may perceive limited job or earnings potential because of his impairment. Thus, in modeling the probability of being in the labor market group and the probability of being a disability transfer recipient, a cumulative measure of the severity of a health problem is utilized. In addition, the probability of being in either of the two groups depends on the current extent of disability, which we measure with a variable indicating the percentage of lost functional capabilities.

The estimates which we present are based on a reduced form model.[15] As a first step, probit equations to predict the probability of being in the labor market or in disability transfer recipiency groups are estimated over the observations in the full sample.[16] The labor market option was defined as either being a labor market participant (having earned income or unemployment benefits greater than zero) and having no disability-related transfers, or having disability transfers greater than zero but earnings in excess of $3360.[17] The disability transfer reci-

piency option is defined as having disability transfers (except Workers' Compensation) greater than zero and earnings less than $3360.[18]

The variables in these reduced form, probit equations reflect those demand- and supply-side characteristics of both the labor market and the disability transfer recipiency "market" which are likely to affect the presence of an individual in either group. Hence, the determinants of both the probability that a person will be successful in gaining employment and that he will meet disability transfer program eligibility criteria are included. Also included are factors related to the income flows in each status. A reduced form specification is used to avoid simultaneous equation bias arising from the omission of any important variables in the alternative structural equation model.

Past experience, education, and disability status capture the individual's perception of his potential work capacity and productivity, as does age. They also describe important determinants of eligibility for disability transfers. Marital status and the presence of children reflect the income requirements of the household. The unemployment rate and the region reflect employment opportunities in the individual's labor market, and hence affect the likelihood both of obtaining a job and of gaining eligibility for disability transfers.

Region of the country also proxies the differential application of eligibility determination criteria. Veteran's status indicates eligibility for military-related disability benefits. Past usual-occupation proxies disability pension coverage and, in the labor market equation, past earnings. Race enters the equations to capture the effect of potential labor market discrimination in constraining employment opportunities

and as a determinant of eligibility for disability transfers. Religion is entered as a taste variable.

From equations (13) through (18), the expected income flow in the labor market option and the expected income flow in the disability transfer recipiency option are estimated for each individual in the sample. We use these in our choice model [equation (19)]. In one estimate, only these expected income streams are employed; in an alternative specification, we include factors affecting the stigma cost associated with not working--the extent of disablement, age, the presence of dependents, and the volume of unearned non-transfer income.

The model is estimated over men aged 45-62 in 1978. We exclude workers older than 62 since most are eligible for Social Security early retirement benefits at that age. Inclusion of this group of workers would further complicate the estimation problem and mask the role of disability transfers in the early retirement decision. Evidence suggests that the availability of disability transfers is less likely to alter the work status choice of men below 45 years of age. Other researchers have also focused on this older age group.

5. EMPIRICAL RESULTS

Tables 3 through 6 present our empirical results on the determinants of the work status choice of older workers, emphasizing the role of expected income flows in two alternative options.

The probit equations in Table 3 estimate the probability of being in the alternative work status classifications. They provide both the basis for imputing this probability to each individual, and the inverse Mill's ratio for the regressions predicting income flows in the two

TABLE 3

Probit Equations for Predicting the Probability of (1) Labor Market Participation and (2) Disability Transfer Recipiency

Explanatory Variables	Labor Market Participation		Disability Transfer Recipiency	
CONSTANT	-330.65	(0.8)	339.45	(0.9)
Cum Dis Severe	-3.03	(2.9)*	3.73	(3.4)*
$(CUMDSEV)^2$	0.32	(0.3)	-0.96	(0.8)
PERDIS	-1.13	(1.0)	1.67	(1.3)
$(PERDIS^2)$	-0.28	(0.3)	-0.30	(0.3)
AGE78	0.02	(0.2)	-0.05	(0.5)
Age spline 52	0.02	(0.2)	-0.006	(0.006)
Age spline 59	-0.35	(2.4)*	0.35	(2.2)*
Educ	0.26	(0.9)	-0.45	(1.3)
Ed spline 8	0.03	(0.3)	-0.08	(0.6)
Ed spline 11	0.04	(0.3)	-0.10	(0.5)
DWHITE	0.38	(1.6)	-0.15	(0.6)
UnRate78	-0.03	(0.6)	-0.01	(0.3)
DPROT	-0.50	(1.4)	1.06	(2.5)*
DCATH	-0.56	(1.4)	0.96	(2.0)*
DJEW	-0.56	(0.8)	0.51	(0.5)
DSESDOWN	-0.11	(0.5)	0.41	(1.7)
NMARNK	-0.71	(2.0)*	0.93	(2.4)*
MARNK	-0.31	(1.1)	0.38	(1.3)
KIDS1878	0.002	(0.02)	0.01	(0.1)
DSPOUSEWK77	0.31	(1.4)	-0.23	(1.0)
D Par Wealthy	-0.15	(0.4)	0.12	(0.3)
Other household income	-0.00002	(1.1)	0.00002	(1.3)
DSOUTH	-0.55	(1.7)	0.40	(1.2)
DWEST	-0.31	(0.8)	-0.006	(0.02)
DNC	-0.35	(1.0)	0.11	(0.3)
DVET	-0.27	(1.4)	0.43	(1.9)*
Age ed	-0.006	(1.1)	0.009	(1.5)
DPROF	67.12	(0.9)	-68.68	(0.9)
DMANAG	4.29	(0.9)	-4.62	(1.0)
DClerical Sales	-7.05	(0.8)	7.50	(0.9)
DCRAFT	44.19	(0.9)	-45.18	(0.9)
DOPERATIVE	34.37	(0.9)	-35.13	(0.9)
DFARM	-248.80	(0.9)	254.35	(0.9)
DMISC	37.65	(0.8)	-38.18	(0.9)
OCCLIM	28.41	(0.9)	-29.06	(0.9)
Cumyr 73	-0.006	(0.3)	0.0002	(0.01)
2 × Log Likelihood Ratio	495.0		497.2	
No. of observations	967		967	

Note: t-statistics are given in parentheses.
*Significant at the .05 level.

options. The income regressions in Table 4 are estimated over the sample included in each work status group. The inverse Mill's ratio to correct for potential selectivity bias (stemming from the likelihood that those not included in a classification have coefficient estimates which differ from those included) is included as an independent variable. For each individual, expected income flows in the two options are the product of the imputed probability of being in the classification and the imputed expected income flow if one is included.

The final step in the analysis posits that the choice between the two work status options depends on expected income flows in the two options and the stigma costs of not working. Because the stigma costs of not working cannot be estimated directly, we use proxies which imply that these costs are greater the younger the worker, the less severe his current health problem, the greater the number of persons dependent on him, and the smaller the volume of his independent asset income. The results of this estimation are presented in Table 5.

The reduced form probit equation for predicting presence in the disability transfer recipiency group is shown in column 3 of Table 3. It indicates that the intensity and duration of severe disability (Cum Dis Severe) is a significant positive determinant of being in this status. Other significant determinants include age (those aged 59-62 are much more likely to be in this group), veteran's status (where the effect is also positive), and being not married and without dependent children. Tastes, as measured by religion, are also a significant influence on the probability of being in the disability transfer group.

The reduced form probit equation predicting presence in the labor market group is shown in column 2 of Table 3. Persons with greater

intensity and duration of disablement are much less likely to be in the labor market group, i.e., to have earned income. Again, it is the dominant variable. Most of the other determinants are insignificant, except age above 59 (which has the expected negative sign), race (which is significant at the 10% level and may indicate some labor market discrimination), DSOUTH (which may indicate either lower wage rates or possibly migration of nonparticipants to the South), and being not married and without dependent children (which has the expected negative sign).

The reduced form equations used to estimate expected income in each status are shown in Table 4. For predicting income if one is in the disability transfer recipiency group (column 3), the extent to which a person is currently disabled has a large and significant (at the 10% level) positive effect. Duration and intensity of disability is not significant, suggesting that once one is found to be eligible for benefits, it is current inability to function in the labor market which is the basis for determining the amount of transfers. The nonlinear relationship of current disability may indicate that those with severe handicaps have a reduced likelihood of earning more than the income cutoff. Need (as measured by either being married or being not married without dependent children) has the expected negative sign. Benefits are, in part, based on family size. Prior earnings, as measured by usual occupation, have some influence. (DMISC includes police and firemen, who tend to have extensive disability pension plans.) Race is significant in predicting disability-related income flows, suggesting either differences in application propensity on average, or discrimination in awarding benefits. Age is also important, possibly reflecting prior earnings. South

TABLE 4

Ordinary Least Squares Regressions for Predicting Income Flows Under the Labor Market Options and Disability Transfer Recipiency

Explanatory Variables	Labor Market Participation		Disability Transfer Recipiency	
CONSTANT	-8036.4	(0.5)	24658.0	(2.2)
Cum Dis Severe	-7663.9	(0.7)	-2468.9	(0.7)
$(CUMDSEV)^2$	32.1	(0.002)	1381.1	(0.5)
PERDIS	-3526.9	(0.6)	8781.5	(1.8)
$(PERDIS^2)$	777.4	(0.1)	-6326.0	(1.5)
AGE78	235.9	(0.8)	-432.5	(2.0)*
Age spline 52	-198.1	(0.6)	284.4	(1.0)
Age spline 59	-394.6	(0.5)	-462.6	(1.0)
Educ	2327.9	(2.3)*	-2610.8	(2.6)*
Ed spline 8	-316.6	(0.5)	158.7	(0.5)
Ed spline 11	1990.7	(3.9)*	308.8	(0.5)
DWHITE	951.0	(1.0)	1436.1	(2.4)*
NMARNK	-5653.6	(3.4)*	-2335.4	(2.3)*
MARNK	1299.2	(1.3)	-2335.3	(2.7)*
KIDS1878	177.6	(0.5)	-430.5	(1.7)
DSPOUSEWK77	-2251.3	(2.9)*	84.6	(0.1)
D Par Wealthy	3817.6	(3.4)*	2800.4	(2.4)*
Other household income	-0.03	(0.5)	-0.009	(0.2)
DSOUTH	-1735.9	(1.7)	-1529.7	(2.1)*
DWEST	-464.1	(0.4)	-1772.5	(1.4)
DNC	525.1	(0.5)	-268.4	(0.3)
DVET	363.4	(0.5)	437.3	(0.7)
Age ed	-38.5	(2.2)*	49.1	(2.7)*
DPROF	4696.9	(2.5)*	480.3	(0.3)
DMANAG	9267.5	(5.7)*	630.3	(0.5)
DClerical Sales	4584.3	(2.5)*	2742.6	(2.1)*
DCRAFT	5490.1	(3.7)*	1393.5	(1.5)
DOPERATIVE	4439.1	(3.0)*	2160.1	(2.5)*
DFARM	-2311.0	(1.0)	-1845.2	(1.2)
DMISC	6106.6	(1.8)	4468.1	(3.0)*
Cumyr 73	117.6	(1.2)	45.2	(1.1)
λ	2397.8	(0.6)	194.2	(0.2)
No. of Observations	837		119	
R^2	.60		.79	

Note: t-statistics are given in parentheses.
*Significant at the .05 level.

is again significant, and implies that lower disability benefits are paid in the South or that more stringent eligibility rules are applied, or that prior earnings on which some transfer benefits depend are lower in the South. Finally, the negative coefficient on education suggests that eligibility determination reflects vocational opportunities. The selectivity term is not significant.

The income equation in column 2 of Table 4 has few unexpected coefficients. The positive effect of education, of having wealthy parents, and the pattern of occupation results are all those which economic theory would predict. The negative effects of having a working spouse and being in the South are also expected. The insignificance of disability is somewhat surprising. However, the signs are negative, as expected. And, again, the selectivity term is not significant.

The final estimates in Table 5 indicate the role of disability transfers--their accessibility and level--in affecting the work status choice of older men. In the table, two versions of the reduced form model are shown. In the first, the presumption is that the older worker bases his choice on an expected income flow which reflects both the probability of success in securing an income flow in each status and the expected income flow in that status if he is successful. This version corresponds to equations (13) through (18), is designated by $[\widehat{E(LE)}; \widehat{E(DT)}]$ in the table, and is our preferred estimate. The second version presumes that the choice is based only on the expected income flow in each status, assuming that the probability of success in securing an income flow in each status is unity. This version uses only equations (14) and (17) in estimating income flows (with the coefficient on the Heckman term used in the estimation), but not the predictions, and is

TABLE 5

Probit Estimates of the Determinants of Work Status Choice

	Simple Model coefficient (t)	Extended Model coefficient (t)	$\bar{X}$	σ
Expected Labor Market Income				
$\widehat{E(LE)}$	.17 (8.5)*	.18 (7.0)*	$14,340	$8411
LE[a]	.19 (14.1)*	.10 (4.8)*		
Expected Disability Transfer Recipiency Income				
$\widehat{E(DT)}$	-.31 (5.5)*	-.23 (3.5)*	$ 632	$1600
DT[b]	-.23 (8.3)*	-.07 (2.1)*		
PERDIS				
$\widehat{E(LE)}$; $\widehat{E(DT)}$		-.47 (1.7)	1.7	.35
LE[a]; DT[b]		-1.71 (7.3)*		
Age 78				
$\widehat{E(LE)}$; $\widehat{E(DT)}$		-.03 (1.5)	52.9	5.0
LE[a]; DT[b]		-.05 (3.1)*		
NMARNK				
$\widehat{E(LE)}$; $\widehat{E(DT)}$		.06 (2.2)*	.08	.27
LE[a]; DT[b]		-.13 (.5)		
Unearned Income				
$\widehat{E(LE)}$; $\widehat{E(DT)}$		-.06 (3.3)*		
LE[a]; DT[b]		-.04 (2.0)*	$ 1538	$4581
Constant				
$\widehat{E(LE)}$; $\widehat{E(DT)}$	.04 (1.9)	1.64 (1.6)		
LE[a]; DT[b]	.14 (1.0)	3.91 (4.0)		
(2 × Log Likelihood Function)				
$\widehat{E(LE)}$; $\widehat{E(DT)}$	500*	515*		
LE[a]; DT[b]	354*	421*		

Note: For the dependent variable: $\bar{x}$ = .867; σ = .34

*Significant at .05 level.

[a]LE stands for $\widehat{LE/P(LE > 0)}$ where the estimates are based on the α's and β's from equation (14). See notes 12 and 13.

[b]DT stands for $\widehat{DT/P(DT > 0)}$ where the estimates are based on the α's and β's from equation (17). See notes 12 and 13.

designated [$\widehat{LE}$; $\widehat{DT}$] in the table. Both versions are estimated in a simple and an extended form.

In both versions of the model, and in both the simple and extended forms, expected income in the disability transfer option is negatively related to the decision to opt for participation in the labor market. E(DT) and DT are statistically significant at the .05 level. All but one of the variables representing the stigma costs of not working have the correct sign and are in most cases statistically significant. The exception is not being married or having dependent children. The elasticities (at the mean) implied by the derivatives are small--that for income in the disability transfer recipiency option is -.006 in the simple model, -.003 in the extended; for income in the labor market option, the elasticity is .02 in the simple model and .05 in the extended model.[19]

Thus, while the response to the incentives implicit in disability transfers--increased leniency in eligibility or more generous benefits --are verified and statistically significant, their quantitative significance is not substantial. Indeed, a doubling of expected disability transfer benefits is likely to generate a decrease in the percentage of those choosing the labor market option by slightly more than one half percentage point.[20] This is approximately a reduction in the labor force of 130,000 older workers. This response is several orders of magnitude smaller than that of previous studies. However, the significant effect of expected disability benefits on work status does indicate that this factor is a partial explanation of the growth of disability transfer expenditures and the decrease in labor force participation (Table 1).[21]

Table 6 presents the derivatives of labor market participation with respect to expected disability-related transfers and expected earnings at

TABLE 6

Labor Market Earnings [$\widehat{E(LE)}$; $\widehat{LE}$] and Disability Transfer Income [$\widehat{E(DT)}$; $\widehat{DT}$]

Variables set at:	$\widehat{E(LE)}$	$\widehat{E(DT)}$	$\widehat{LE}$	$\widehat{DT}$
Simple equation at means	.0048	-.0086	.0122	-.0144
Extended equation[a] at means	.0034	-.0042	.0066	-.0050
PERDIS = 0	.0027	-.0035	.0036	-.0027
PERDIS = 1	.0081	-.0102	.0349	-.0263
Age = 45	.0019	-.0024	.0028	-.0021
Age = 59	.0050	-.0063	.0115	-.0087
Earnings + σ	.00003	-.00003	.0011	-.0008
Earnings - σ	.0454	-.0571	.0214	-.0161
PERDIS = 1; Age = 59	.0113	-.0143	.0385	-.0290

[a]Other variables in extended equation set at their means.

the means of the distributions and at selected relevant points in the disability, age, and earnings distributions. Several results should be noted. First, when the extended equation is used, the derivatives on both of the expected income terms fall substantially. In particular, the important direct role of the disability status indicator is relevant here. Second, as expected, the more severe is current disability, the greater is the effect of expected income considerations on the work status choice. Similarly, age matters a good deal. The derivative at age 59 is 2-4 times that at age 45, and about one and a half that at the mean. Finally, the most significant factor is the level of expected labor earnings. For those with low expected earnings, the labor force effect of both expected disability transfers and expected labor market earnings is very much greater than for those with average or high expected income.

The elasticities for these same alternative characteristics indicate similar patterns. The lowest computed elasticity is for those whose earnings are one standard deviation above the mean--.0006 for labor market income, -.0002 for disability transfers; the highest computed elasticity is for those with earnings one standard deviation below the mean---.324 for labor market income, -.043 for disability transfers. All of these differential responses to the economic incentives have the expected signs.

6. CONCLUSION

These estimates suggest that the increasing relative generosity and/or leniency of disability income transfer programs do have a statistically significant, though quantitatively small, effect on the work

effort choices of older workers. These estimates also partially explain the growth in these programs. Nevertheless, they leave many questions unanswered. No insight is gained into the relative contributions of several other relevant variables to the fall in labor force participation rates or the rise in the number of disability program recipients. While disability benefit generosity or leniency appears to have played a small role in explaining the reductions, the contributions of changes in tastes for work, changes in social expectations regarding early retirement, changes in the physical demands of occupations, changes in the incidence of impairments, and changes in income from spouses and other sources remain unexplained.

The difference between our elasticity estimates and those of other researchers also remains unexplained. Parsons finds very large work status responses to his replacement rate variable, but comparison of our results with his is difficult. The construction of his replacement rate variable causes (1) it to be dominated by variation in the wage rate denominator rather than the expected disability transfer numerator,[22] the (2) expected benefit numerator to be highly correlated with the wage rate denominator,[23] and (3) the expected wage rate for those not working to be overstated (and hence the replacement ratio for these workers to be understated).[24] Leonard's estimate of elasticity also appears to be exaggerated because of his specification of expected earnings, his definition of the transfers variables, and the nature of his disability variables.

Because the wide range of estimates of the effect of disability transfer generosity is disconcerting, we have undertaken a variety of alternative specifications. On the basis of these results, we are rela-

tively confident that the response to increases in transfer program generosity or leniency is a statistically significant factor in the work status choice. However, it is quantitatively small. Further exploration of these important policy questions requires improvements in disability status measures[25] and in data, including those on application and eligibility determination.

Notes

[1]Nearly all of the empirical analyses of the work effort impact of disability transfers are for the United States. In addition to those in the table, there are a number of earlier studies using less adequate data and techniques. See Luft (1975); Scheffler and Iden (1974); Berkowitz, Johnson, and Murphy (1976).

[2]The costs of pursuing either of the options are not trivial. Consider, for example, the costs of applying for disability transfers. Gaining eligibility to the primary disability transfer program, SSDI, requires a 5 month waiting period with "no substantial gainful employment." Application, then, entails the lost income from labor market option during the 5 month period, and the lost work experience during the same period. Because both the probability of securing employment and the expected income if working depend upon recent experience, the cost of applying for disability transfers includes these expected income losses as well. Similarly, the costs of seeking and accepting employment are reflected in a reduced probability of gaining eligibility for disability transfers. Recent work experience is interpreted as evidence that disability is not sufficiently severe as to warrant public income support.

[3]All of these factors have been cited as accounting for the low "take-up rates" in public transfer programs, even those not requiring a limitation of earnings.

[4]In this formulation, welfare income can be ignored, as the safety net it provides is equal in the event of failure to gain admission to either state.

[5]This maximization approach has been developed by Gronau (1974), Hall (1973), Hanoch (1976), and Heckman (1974, 1979). When a person chooses to work it is presumed that his reservation wage--the monetary value of not working--is less than the market wage.

[6]As we will emphasize below, our empirical specification of this choice is more complex than this description. The specification reflects the fact that the income stream available if one chooses the labor earnings option contains some transfer income. Similarly, the income stream expected if one chooses the disability transfers option may contain some earnings and nondisability transfers. These combinations of income in the two options reflect the presence of earnings limitations in disability programs which are greater than zero, but not substantial.

[7]An upper-bound estimate of $\widehat{P(LE > 0)}$ and $\widehat{P(DT > 0)}$ would be unity for all groups of individuals with homogeneous characteristics. This would imply that all individuals in a group applying to each option are admitted to it.

[8]Because individuals are in the labor market group if $P(LE) > 0$ or $\varepsilon_2 > D^*\alpha + X_2\beta_2$, it is reasonable to think of the selection rule for presence in this group as these inequalities.

[9]The ratio of the ordinate of a standard normal distribution to the right-hand tail.

[10]This procedure also assumes that there is an additive conditional disturbance term with desirable properties.

[11]Note that for those not observed in the labor market, the complement of the Mill's ratio is used: that is, $\frac{-e^{-\hat{\rho}_2^2}}{\sqrt{2\pi} \cdot 1-\hat{\rho}}$ instead of $\frac{e^{-\hat{\rho}_2^2}}{\sqrt{2\pi} \cdot \hat{\rho}}$.

[12]It is possible that the individual does not weigh his expected income by the probability of being in that group. In this case, $\widehat{E(LE)}$ simplifies to $\widehat{LE/P(ALE > 0)}$. While the estimate is based on (14), it does not employ the coefficient on the Heckman term in the estimation.

[13]As suggested above, individuals may choose only on the basis of the expected income flow in each status. For disability transfer recipiency the individual only looks at the expected payments from transfer, not the probability of receipt. In this case, E(DT) simplifies to DT/P(ADT > 0) and is estimated using (17), not including the λ for the predictions.

[14]λ_2 is the inverse Mill's ratio, and again represents the standard Heckman correction. It is necessary as the income flow for disability transfer status is imputed to all observations from a regression fit to those who are in the disability transfer recipient group. λ_2 is obtained from (16). Again, for the estimates using λ_2 the complement is used for those not currently receiving transfers.

[15]In the model described in Section 3, it is assumed that $X_2 = X_3$ and $X_1 = X_4$.

[16]Individuals can be in either work status--in the labor force or on disability--or in neither. Of the full sample of 967 observations, 958 had income flows from at least one of the relevant sources.

[17]The $3360 cutoff was chosen because it is the annual equivalent of the monthly earnings limit in the dominant disability-related transfer program. Eight hundred thirty-seven observations are in this group.

[18]Disability-related transfers are defined to include benefits from SSDI, Supplemental Security Income (a program of income-tested benefits directed at the blind and disabled), veterans' disability benefits, other

disability pensions, and, if disabled, a share of other welfare and help from relatives. One hundred nineteen observations are in this group.

[19]This differential in the elasticities is expected, as the variance relative to the mean in the distribution of expected income in the disability transfer option is over 5 times that in the expected income distribution for the labor market option.

[20]This ratio is a close surrogate for the labor force participation rate.

[21]To test the sensitivity of these results, we estimated a variety of additional choice models--some structural and some reduced form--each representing a different view of the nature of the decision process. These include a set of structural equations which are used to estimate expected income if the labor market option and expected income if a disability transfer recipient. These are estimated as expected values, both using the estimated probability and not using the probability. In addition, in the final probit for both the structural and reduced form models, actual income streams are used for those individuals with observed values. Imputed values are used only for those without observed values. (This assumes that the observed values are the best predictor of income expectations.) Results from all of these are quite consistent with the reported results: the elasticities from the reduced form estimates using observed values are .0022 and .007 for the labor market income streams (simple and extended) and -.003 and -.001 for the disability transfer income stream (simple and extended). These verify the generally significant but quantitatively small effects of the generosity of disability transfers on the work status choice. The structural estimates, based on a slightly different definition of the work status choice

(labor force participation is the variable explained) show a similar pattern: the elasticities (using probabilities) are .082 and .051 for the labor market income stream. The results not using probabilities generally have somewhat larger (but still quite small) derivatives.

[22]All workers are imputed expected benefits from benefit tables based only on estimated prior earnings (no provision is made for dependent allowances). Parsons' procedure assumes that the decision whether or not to receive disability transfers is solely that of the worker.

[23]Benefits are assumed to depend only on prior wage rate, which is highly correlated with the current wage rate.

[24]Parsons imputes a wage rate for those with no wage rate from a regression on those with a wage rate.

[25]For example, Parsons (1979) indicates the sensitivity of results to the nature of the disability status variable, and emphasizes the possible simultaneity of reported disability (on which our variables are constructed) and non-labor-force participation.

Appendix 1

Variables Used in Estimates

Disability Variables

Cum Dis Severe: negative exponential of years severely disabled 1968-1978, largest weight on 1978; $(CUMDSEV)^2$: square of Cum Dis Severe; PERDIS: percent currently disabled, from 0 for no disability to 1 for totally disabled; $(PERDIS)^2$: square of PERDIS.

Dependents and Needs Variables

NMARNK: dummy variable = 1 if not married and no children under 18; DMarried: dummy variable = 1 if currently married; MARNK: dummy variable = 1 if currently married and no children under 18; KIDS1878: number of children under 18 in 1978; DSPOUSEWK77: dummy variable = 1 if spouse worked in 1977; Other household income: household income not due to respondent ($000); Unearned income: income from assets, rent, dividends, interest, and alimony ($000).

Tastes and Market Opportunities Variables

DPROT, DCATH, DJEW are dummy variables = 1 if person's religion is in each category, omitted category is no religion; DWHITE: dummy variable = 1 if person is white; DVET: dummy variable = 1 if person is a veteran; DSOUTH, DWEST, DNC (North Central) are dummy variables = 1 if person currently resides in each area, omitted category is East; OCCLIM: % of male labor force in usual 1 digit industry who are functionally limited; DPROF, DMANAG, DClerical Sales, DCRAFT, DOPERATIVE, DFARM are dummy variables = 1 if usual occupation is in each category; DMISC: usual occupation is armed forces or protective services; AGE78: age in 1978; Age spline 52: second piece

of linear spline corner at 52; Age spline 59: third piece of linear spline corner at 59; UnRate 78: area-specific unemployment rate in 1978; DSESDOWN: dummy variable = 1 if socioeconomic ranking of last occupation lower than usual occupation.

Human Capital Variables

Cumyr 73: years of work experience as of 1973; Educ: years of education; Ed spline 8: second piece of linear spline; corner at 8 years of education; Ed spline 11: third piece of linear spline; corner at 11 years; Age ed: age times education; D Par Wealthy: dummy variable = 1 if parents well off when person growing up.

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